# PRE-CONSTRUCTION BIOTIC COMMUNITY MAPPING RESULTS

**Report of Results for the Pre-Construction Mapping of Submerged Aquatic Vegetation (SAV), Emergent Marsh Vegetation, Shellfish Habitat, and Fringing Terrestrial Communities for the Bogue Inlet Relocation Project, Emerald Isle, North Carolina**

## 1.0 Introduction

This technical report was prepared to provide supporting documentation for the biotic community, SAV, and shellfish pre-construction mapping for the Bogue Inlet Relocation Project. This document serves to identify and document natural biotic communities of the study area. The study area is located at the border of Carteret and Onslow Counties, and includes the Permit and Survey Areas as depicted on a figure provided to CZR Incorporated on 5 May 2003. The Permit Area encompasses Bogue Inlet, Bogue Sound, and Bogue Banks, Dudley Island, Bear Island, Emerald Isle beaches, West Channel, and Banks Channel. The Survey Area is slightly larger than and includes the Permit Area, in addition to the expansive marshes north of Dudley Island, Huggins Island, and the dredge spoil islands adjacent to the Intracoastal Waterway.

## 2.0 Methodology

Biotic communities were digitally mapped using Didger 3 software (Golden Software, Inc. 2001) over georeferenced digital multispectral aerial photographs (revised June 30, 2003, State Plane, NAD 83, feet). Field survey and confirmation of communities were conducted by boat, vehicle, and foot. SAV, shellfish habitat, the boundaries of marsh vegetation, and fringing terrestrial communities were mapped through visual interpretation of the aerial photography and field confirmation. Marsh was classified as low marsh or high marsh. Fringing terrestrial communities were classified as wetland or non-wetland, as well as by general vegetation type (shrub-scrub, hardwood forest, mixed pine – hardwood forest, dune grasses, and unvegetated sand). Beaches, dunes, and developed areas on Bear Island and Bogue Banks were not mapped by CZR Inc. Beaches and dunes on Dudley Island and any other supratidal islands in the study area were mapped. Subtidal and intertidal shoals and mudflats were not mapped. Plant species listed represent species observed on-site as well as species described by Shafale and Weakley (1990).

### 2.1 Submerged Aquatic Vegetation (SAV)

SAV boundaries were mapped in the Permit and Survey area by visual interpretation of multispectral photography and referenced NOAA 1992 photo interpreted seagrass data provided by Coastal Planning and Engineering. The extent of all mapped SAV polygons in and immediately adjacent to the Permit Area were confirmed in the field using visual observations in shallow water. A Trimble Pro XR GPS unit (sub-meter accuracy) was used to determine the general limits of SAV boundary occurrences. Specimens were taken back to the office to verify identification of dominant species. Ten percent of the SAV polygons mapped in the Survey Area from the referenced NOAA

1992 photo data were verified in the field. To further evaluate the presence/absence of SAV within the ten percent area, the relative SAV abundance/cover was estimated at selected points located by GPS. SAV was visually assessed and assigned to one of four categories; absent, dead, scattered, or dense. For this study, dead is defined as SAV present, but with a loss of pigment and roots that are non-binding, scattered is defined as percent coverage less than or equal to 70% and dense is defined as percent coverage greater than 70%.

### 2.2 Shellfish Habitat

Using North Carolina Division of Marine Fisheries (NCDMF) data and multispectral aerial photography, two shellfish habitat types were identified and surveyed within the Permit Area. The two habitat types mapped are defined by NCDMF as the V (intertidal, hard, vegetated, and without shell) and W (intertidal, hard, non-vegetated, and with shell) strata. Multispectral photography and NCDMF C004 Shellfish Mapping Program map were used as a guideline to identify two areas of W habitat within the Permit Area. A Trimble GPS unit was used to map the locations of the W strata shellfish habitat. The V and W strata were confirmed visually with NCDMF personnel on 11 September 2003 using a stratifying pole and clam rake and mapped using the multispectral photography.

### 2.3 Emergent Marsh and Fringing Terrestrial Communities

The boundaries of marsh vegetation and fringing terrestrial communities were mapped digitally through visual interpretation of multispectral aerial photography for the Permit and Survey Areas. Marsh was classified as low marsh, dominated by smooth cordgrass (*Spartina alterniflora*) or high marsh, dominated by saltmeadow cordgrass (*Spartina patens*). Fringing terrestrial communities were classified as wetland or non-wetland, as well as by general vegetation type (shrub-scrub, pine forest, hardwood forest, mixed forest, dune grasses, and unvegetated sand). Beaches and dunes on Dudley Island and two supratidal islands in the Permit Area were also mapped. Subtidal and intertidal shoals, such as in the swash platform, and mudflats that are not vegetated were not mapped.

Emergent marsh and fringing terrestrial communities were confirmed in the field via boat, vehicle, and foot. Transects were walked approximately perpendicular to shoreline to ensure thorough coverage of all communities on Bear Island and Dudley Island within the Permit Area. Additional random transects were walked on Huggins Island, Bogue Banks, and dredge spoil islands along the Intracoastal Waterway within the Survey Area. The approximate wetland/non-wetland boundary was estimated with the aid of soil evaluations using a hand auger and Munsell soil color chart.

## 3.0 Biotic Community Descriptions

The term “biotic community” has been used to define a distinct natural community found within the Bogue Inlet Relocation Project Study Area characterized by

vegetation composition, topography, substrate, hydrology, soil characteristics, and other abiotic factors. The following sections discuss each biotic community identified within the Survey and Permit Area. Nine natural biotic communities/habitats were identified and are listed as follows: low marsh, high marsh, shrub-scrub thicket, hardwood forest, mixed pine – hardwood forest, dune grasses, unvegetated sand (beaches), SAV, and shellfish habitat. In selecting these categories, heavy reliance was placed on the plant communities identified and described by the North Carolina Natural Heritage Program (NCNHP) classification (Shafale and Weakley 1990) and the classifications described in the Classifications of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

### 3.1 Submerged Aquatic Vegetation (SAV)

SAV or seagrass beds primarily were found in the high salinity areas of Bogue Sound generally in waters less than six feet in depth. The distribution and composition of seagrass communities are influenced by several factors and among the most important are light, salinity, wave action, and nutrient levels. Cowardin classifies SAV as an estuarine subtidal aquatic bed system. The substrate type is described by NCDMF by primarily consisting of unconsolidated sand bottom, with variable shell content. The dominant seagrass species occurring within the Permit and Survey Area are eel grass (*Zostera maritima*) and shoal grass (*Halodule wrightii*). Dense seagrass beds occur on the east side of Eastern Channel and Banks Channel. There are scattered seagrass beds north of Dudley Island and adjacent to Western Channel.

### 3.2 Shellfish Habitat

Cowardin classifies shellfish strata as an estuarine intertidal reef. The NCDMF has determined the W stratum to contain 98% oysters and 2% clams. Two shellfish areas of W strata were identified within the Permit Area. The boundary of the low marsh biotic community serves as the V stratum in which a significant cover (>30%) of *Spartina alterniflora* occurs. This stratum spans most of the Permit and Survey Area. Substrate type for the V strata consists primarily of coarse sand.

### 3.3 Low Marsh

Low marsh is the most extensive of all biotic communities mapped within the Survey and Permit Area. This community is restricted to the intertidal zone in which smooth cordgrass (*Spartina alterniflora*) is the predominant vascular plant. However, near mean high water, glasswort (*Salicornia* spp.) and sea lavender (*Limonium carolinianum*) become more common. Strong zonation also occurs in the higher parts, with zones of black needlerush (*Juncus roemerianus*) dominating. In the study area, smooth cordgrass is usually less than three feet in height. Cowardin classifies low marsh as an estuarine intertidal emergent wetland that is regularly flooded throughout the study area. Soils of this community are mapped as Carteret sand and Bohicket silty clay loam. Both soil types are defined as nearly level, frequently flooded, and very poorly drained.

These soils are normally found in tidal marshes on the sound side of the barrier islands less than 3 feet above sea level.

### 3.4 High Marsh

The high marsh is an irregularly flooded transitional zone found mostly between low marsh and shrub-scrub communities throughout the study area. Isolated areas typical of this habitat are also found in several interdunal swales or low depressions throughout Bear Island. Vegetation of this community is characteristic of transitional intertidal areas and areas with a high water table in which saltmeadow cordgrass (*Spartina patens*) is the dominant vascular plant; however, sea-oxeye (*Borrichia frutescens*), salt grass (*Distichlis spicata*), rushes (*Fimbristylis* spp.), and shrub species such as marsh elder (*Iva frutescens*) and silverling (*Baccharis halimifolia*) coexist. Cowardin classifies high marsh as an estuarine intertidal emergent wetland or palustrine, emergent wetland. Soils of this community are mapped as Carteret sand and Bohicket silty clay loam.

### 3.5 Shrub-Scrub

The shrub-scrub biotic community, or maritime shrub as classified by NCNHP, is often a transitional community between the low marsh/high marsh stands and the more stable hardwood/mixed forest. Shrub-scrub is dominated by woody vegetation that includes broad-leaved evergreen shrubs and trees, typically less than 20 feet tall. Variations in elevation and flooding frequency within the Survey and Permit Area account for wetland and upland variations of this community type. Wetland shrub-scrub occurs predominantly on the north side of Dudley Island, the southern edge of Huggins Island, and the northern edge of Bogue Banks. Wetland shrub-scrub has been classified by Cowardin as an estuarine shrub-scrub and/or emergent wetland.

Soils of this community are often mapped as Wando fine sand, Carteret sand, and Duckston fine sand. These soils range from well drained sands that occur on ridges mainly along Bogue Sound to nearly level and very poorly drained. Upland shrub-scrub primarily occurs on higher elevations such as on dredge spoil islands adjacent to the Intracoastal Waterway and patches of shrub-scrub can be found throughout Bear Island. Soils of upland areas are often mapped as Newhan fine sand, which is defined as excessively drained and occurs in areas of dredge spoil deposits with a 2 to 10 percent slope, as well as on undulating dunes and barrier ridges with a 0 to 30 percent slope.

Shrubs that dominate the higher elevations include wax myrtle (*Cerothamnus cerifera*), yaupon (*Ilex vomitoria*), red cedar (*Juniperus virginiana*), live oak (*Quercus virginiana*), and loblolly pine (*Pinus taeda*). Vegetation common in lower elevation areas include silverling, marsh elder, wax myrtle, and mixtures of transitional emergent marsh species.

### 3.6 Hardwood Forest

The hardwood forest community primarily follows the NCNHP classification of maritime evergreen forest. Vegetation is typically more developed in areas where protected from salt spray. The canopy is often sculpted by the effects of salt spray into a smooth, streamlined shape rising from shrub-scrub, or maritime shrub, gradually to a tall forest canopy as seen on the north side of Bogue Banks. Variations in elevation and flooding frequency within the Survey and Permit Area account for wetland and upland variations of this community type. Wetland hardwood forest, a palustrine/estuarine, temporary, irregularly flooded forested wetland system, is a very small percentage of the overall communities mapped and occurs on the north side of Bogue Banks west of Emerald Isle, where it may receive irregular flooding by extremely high tides. The soils of this community are mapped as Carteret sand and Duckston fine sand. Both soil types are defined as being nearly level and poorly drained. Upland hardwood forest also occurs on the soundside of Bogue Banks in areas where soils are mapped as Fripp fine sand, which is excessively drained with 2 to 30 percent slopes.

The canopy in these forests is dominated by laurel oak (*Quercus laurifolia*), water oak (*Quercus nigra*), live oak, red cedar, and red maple (*Acer rubrum*). Red bay (*Persea borbonia*) is often a dominant canopy species in lower elevation areas. The subcanopy is dominated by yaupon, ironwood (*Carpinus caroliniana*), American holly (*Ilex opaca*) and flowering dogwood (*Cornus florida*).

### 3.7 Mixed Pine – Hardwood Forest

Mixed pine – hardwood forest community, also referred to as maritime evergreen forest by NCNHP, occurs more extensively than the hardwood forest and includes a co-dominance of loblolly pine. Variations in elevation and flooding frequency account for wetland and upland variations of this community. Wetland mixed pine – hardwood forest, a palustrine/estuarine, temporary, irregular flooded forested wetland, primarily occurs on Bogue Banks surrounding ponds and residential development and on the northeast side of Bear Island in interdunal swales.

Soils of this community are mapped as Newhan-Corolla complex and Newhan fine sand. The Newhan-Corolla complex with 0 to 30 percent slopes consists of Newhan soils on dunes and Corolla soils in interdunal swales. Newhan soils are excessively drained, and Corolla soils are moderately well drained to somewhat poorly drained. Upland mixed pine - hardwood forest is the predominant biotic community type for Bogue Banks, Huggins Island, and the northeast side of Bear Island. Soils of this community are mapped as Corolla fine sand, Fripp fine sand, Newhan-Corolla complex, Duckston fine sand, Newhan fine sand, and Wando fine sand. These soils range from poorly drained to excessively drained. Vegetation composition and diversity of species are similar to hardwood forest with the exception of loblolly pine as an additional dominant species.

### 3.8 Dune Grasses

This community occurs primarily on well drained dunes behind the beach and on older dunes at Bear Island where vegetation cover ranges from sparse to fairly dense. Dune grass was only mapped on Dudley Island. Dominant species include sea oats (*Uniola paniculata*), saltmeadow cordgrass, and other grasses. Soils of this community are mapped as Bohicket silty clay loam; a very poorly drained soil, even though it is apparent that the primary dune of Dudley Island is an excessively drained soil.

### 3.9 Unvegetated Sand (Beach/Supratidal Island)

The unvegetated sand, or beach, community occurs on the oceanward shore of Dudley Island. Island 1 and Island 2 within Bogue Inlet represent supratidal areas mapped within the study area and are included in this community. This community is non-vegetated and the substrate consists of unconsolidated sands, with variable shell content, continually being recontoured by wind and water. Island 1 is mapped as Duckston fine sand which is defined as nearly level and poorly drained.

## 4.0 References

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildl. Serv. Biol. Serv. Program, Washington, D.C.

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